1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

recuperate quickly when the area is again allowed to revert to bush."[38]

Several of the forest services of Southeastern Asia have made a rather successful use of the shifting cultivator in their endeavor to reforest the land. They have combined shifting culture and silviculture by hiring shifting cultivators to cut mature trees and to sow or plant new trees on cut-over or burned-over land. For this the cultivators are paid a small wage. In addition they are allowed to grow their own crops for one or two years between the rows of young trees. This system, known as the "taungya forestry system," was developed in 1856 by the German forester, Dietrich Brandis, while he was Superintendent of Forests in Pegu, Burma.[39] It is ingenious in that it recognizes the habits of the shifting cultivator and fits them into a modern forest economy instead of persecuting the cultivator and forcing him to give up his traditional culture. This system has been used in the teak forests of Java since 1871. The forest service makes a contract[40] with the peasants of Java according to which the peasants are to prepare the land and plant and take care of teak trees (*Tectona grandis* L.) in return for a small sum of money and the right to plant such crops as maize and red pepper (*Capsicum annuum* L.) between the rows of teak. The cultivation of upland rice is discouraged, and the planting of cassava, peanuts, castor beans, and tobacco usually is not allowed (Figs. 40, 41).

The taungya forestry system is an excellent way of getting pure stands of commercial timber. The typical forest of the tropics is expensive to exploit because of the large variety of trees which it contains, many of which have little or no commercial value.[41]

As important as reforestation is soil erosion control. Where shifting cultivation is practiced in mountainous regions it often causes such acceleration in the rate of erosion that the rivers are choked with sediment and periodically do great flood damage. Flood control could be achieved in most cases by completely closing the headwaters and watershed areas to cultivators. On more gentle slopes the clearings should be rather narrow, should parallel the contours, and be separated by belts of forest. If at the same time the forest uphill were protected by fireguards, the clearings would have a chance to close quickly again so that the soil would be

[38] Worthington: Science in Africa, 1938, pp. 378–379.

[39] *Taungya* is the Burmese term for the temporary field of the shifting cultivator, a term that the foresters have adopted. E. P. Stebbing in his work, The Forests of India, Vol. 1, 1922, p. 376, writes:
"Brandis, moreover, recognized that the very system which, till then, had destroyed teak forests might be utilized to produce them, . . . and as early as 1856 an attempt was made in Prome district to sow teak in regular rows, together with the rice scattered by the toungya [*sic*] cutters. Twenty years afterwards this attempt had grown into a regular system, by which areas were being annually stocked with teak at a cost far below that of regular plantations." See also *Ibid.*, Vol. 3, 1926, pp. 415–428.

[40] Becking: "De djaticultuur op Java," 1928, pp. 50–52.

[41] Heske: "Der tropische Wald," 1939, p. 414. Heske's article gives an excellent short account of the forests of Southeastern Asia and points out that they are on the whole much easier to exploit than are the forests of tropical America because of the abundance of cheap labor.

[See p. 41, col 1 -- Andy L]

1:Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

protected against abnormal erosion. Terracing would be the most effective method of checking soil erosion, but this requires a good deal of labor, which is scarce in areas of shifting cultivation.

The Forestry Service of the Indies started an interesting soil-erosion experiment near Tjiwidej in the mountains south of Bandoeng at an elevation of 1800 meters. Two adjacent parcels of forest land, lying on rather steep slopes, are drained separately—out of each parcel comes a little brook—and thus form separate drainage units. Both parcels were used by shifting cultivators who had cut and burned the forest. In one case the slope was left undisturbed; in the other the slope was terraced. At the foot of each slope catch basins were constructed to retain the sediment that was washed down by rain water and transported by the brooks. The amount of water that drains out of each unit was measured and the sediment weighed. The purpose of this experiment was to get quantitative measurements of the amount of erosion that is caused by shifting cultivation and to study the effect of terracing in reducing soil loss. During the first year both parcels lost very little soil, because the humus layer protected it; but in the second year the unterraced parcel lost 5.065 kg. of silt per square meter whereas the terraced parcel lost only one-half as much, or 2.524 kg.[42] (Figs. 42–45).

Under the conditions that we have discussed so far, no radical change in the system of cultivation is required. If, however, the population increases to such an extent that there is no longer enough available land to allow for a sufficiently long rotation cycle, more drastic remedies are necessary.

Such a situation arose in parts of the Outer Islands and attracted the attention of government specialists. Legal experts familiar with Indonesian customary law, foresters, and agricultural advisers collaborated to seek a solution.[43] Realizing that shifting cultivators are usually reluctant to give up their traditional form of land use, the specialists approached the ladang problem by searching for means of reforesting ladangs quickly. Experiments were made with the planting of quick-growing leguminous and non-leguminous trees, bushes, and shrubs to shorten the fallow period, restore the humus, protect the soil against accelerated erosion, eliminate the grasses, and, in the case of leguminous species, improve the soil by adding nitrogen.[44] We have already seen, however, that artificial refor-

[42] I was able to visit the Tjiwidej experiment with Mr. L. Gonggrijp, under whose supervision the work was carried out. For a detailed report on the project see Gonggrijp: "Het erosie-onderzoek," 1941, pp. 200–220.

[43] H. J. Friedericy of the Department of the Interior and H. Vonk and E. J. Wind of the Department of Economic Affairs, for example, worked together on the problem of ladang culture in the residency of Palembang.

[44] Experimental plantings included, among others, *Erythrina lithosperma* Miq., a light-loving tree which is typical in Southeastern Asia of dry, rather open climax forests and of second-growth forests; *Hibiscus tiliaceus* L.; *Albizzia falcata* Backer, one of the fastest-growing trees of Southeastern Asia, used widely as a shade tree on coffee plantations; *Aleurites moluccana* Willd., a tree at home in the drier parts of the East Indies; *Leucaena glauca* Benth.; *Pterocarpus indicus* Willd., a large tree frequently used along roadsides as

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL 1

estation is not a discovery of Western-trained scientists but has long been practiced by certain groups in Southeastern Asia. It was the plan of the government to spread and enforce this practice of artificial reforestation wherever advisable. This practice, whereby the cultivator determines the vegetative cover during the fallow period instead of abandoning the ladang to chance growth, brings him to a transition stage between shifting cultivation and permanent cultivation. From there the step to permanent cultivation with crop rotation is but a short one.

Permanent cultivation requires repeated tilling and therefore more labor and tools than the shifting cultivator is accustomed to. Work animals are also desirable. An important obstacle to intensification of agriculture in wide areas of Southeastern Asia, however, is the fact that hill and mountain regions [up to about 1500 meters in elevation] are frequently infested with malaria so that the energy of the people is greatly reduced.[45] Moreover, the acquisition of such implements as plows, harrows, and hoes, and especially of work animals, calls for financial resources or credit, both of which the average shifting cultivator lacks. Some shifting cultivators do own livestock, such as cattle or carabaos, but utilize neither their labor nor their manure. Groups of the Mois in the mountains of Annam have carabaos, but they do not use the animals in their agricultural activities because they "cannot talk" to them.[46] On the Lesser Sunda Islands livestock is kept because it gives social prestige to the owner. Overstocking of the pasture areas on these islands has led to overgrazing and has cut into the forest area until there has developed a scarcity of land suitable for ladang cultivation. The same has happened in large areas in Africa. There it has been necessary to teach the native peasant the use of cattle and make him familiar with the plow. This was done successfully in northern Nigeria by combining the animal husbandry of the nomadic Fulani with the indigenous shifting cultivation of the Hausa peasant, thus developing "a system of permanent farming whereby a man with cattle of his own, say two working oxen and a few cows, can plough and maintain in fertility an area of land sufficient to supply all the requirements of himself and his family, and to obtain a surplus balance as a return for his labour. . . . Thus mixed farming represents a gradual evolution from the shifting methods of cultivation to a staric type of agriculture, by the introduction of animal husbandry, and with the use of animal cultivation."[47] Above all, the peasant learns to preserve the animal manure and

a shade tree; *Dolichos lablab* L., a climbing herb which is valuable as a vegetable; *Crotolaria anagyroides* H.B. and K., a bush of vigorous growth which attains a height of from 12 to 14 feet and forms an excellent green manure; *Tephrosia candida* DC. and *Tephrosia vogelii* Hook., low shrubs useful as green manures; and *Mimosa invisa* Mart., a leguminous creeper which suppresses grasses.

[45] Gourou: L'utilisation du sol, 1940, pp. 181 and 350.

[46] *Ibid.*, p. 354.

[47] King: "Mixed Farming in Northern Nigeria," 1939, p. 271. See also Faulkner and Mackie: West African Agriculture, 1933; and by the same authors: "The Introduction of Mixed Farming in Northern Nigeria," 1936, pp. 89–96.

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

gated fields. One of the great advantages of garden culture over field culture is that there is always something ready to harvest from the former and therefore something to sell when money for daily household needs becomes scarce. Another advantage is that the garden supplies the family with a great variety of side dishes rich in vitamins; the vegetable proteins of the garden produce are also of high value.

As to the possibilities of improving garden culture, these two authors state:

> It is very evident that an improvement of the compound horticulture is a very difficult problem through the highly varied and dense planting of these compounds as a result of which they come to resemble a very complicated symbiosis. But for all this it must be possible by systematic investigation to improve not only the quality but also the quantity of the production. It may be said that the compounds with their story or layer formation superficially considered will find no favour in the eyes of western agriculture, but they are an essential link in the native production apparatus.[3]

The alarming decline in the welfare of the people of Java in the face of a mounting population prompted Netherlands Indies officials to examine every possibility of improving the peasants' condition. This accounts for the studies of Ochse and Terra. Lacking detailed studies outside Java, we are obliged to depend upon scattered references of uneven value.

Credner states that in Thailand practically every house has a few trees on the lot, and the villages are often hidden by tree clusters. The greatest intensification of garden culture is found on the right bank of the Mae Nam Chao Phraya (the Menam) in Bangkok Noi, just opposite Bangkok. Here irrigation is employed in garden culture, a technique not usually found in Southeastern Asia. The gardens are surrounded by walls 1 meter high and are traversed by trenches 2 meters apart. The beds between the trenches are elevated. The trenches work both as drains and as irrigation ditches. Small sluices control the water. In the gardens there is a great variety of fruit trees and palms which climbers, such as *Piper betle* L., use as supports. In the trenches the peasants grow lotus and water chestnut (*Trapa natans* L.).[4] Zimmerman, in his survey of rural Thailand, points out that in most regions the peasants rely too much on one crop, rice, and he recommends in several instances improvements in the cultivation of the home lots so that families may have a better supply of fruits and, above all, of vegetables. In the Khlong Rangsit section he observed that "on account of the lack of homestead and village sites among the people there is no gardening and home production of food."[5] This observation may be applied to Southeastern Asia in general. Wherever the dominant form of land tenure is tenancy the flimsy shack of the tenant has no mixed fruit and vegetable garden around it, for his status is much too uncertain. A tenant

[3] Ochse and Terra: *op. cit.*, pp. 371–372.
[4] Credner: Siam, 1935, p. 246.
[5] Zimmerman: Siam, 1931, p. 307.

L: Peizer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

lanzones, papayas, and chicos, which find a good market in Manila, but on the whole we rarely meet in the Philippines such intensive garden culture as in Java. The diet of the average Filipino is not well balanced and is particularly deficient in fruits and vegetables. In recognition of this fact the Bureau of Education and the Bureau of Plant Industry have both done much to impress the peasants with the need for fruit and vegetable gardens. Although the situation has improved during the past forty years and a large variety of fruits is now produced, the country still depends upon imports, whereas with a little effort most of the imported fruits could be produced locally and would furnish an additional source of income. It would be well to encourage the peasants to grow more fruits and to advise them on the most suitable varieties. In the other countries of Southeastern Asia, also, with the possible exception of Java, such advice would be valuable.

The published material available on the importance of gardens in Indochina is similarly limited in quantity. Even Gourou in his study of land utilization restricts himself chiefly to listing the fruits and vegetables found in the gardens and to stating that certain districts are renowned for the quality of their garden fruits. Gourou's list of fruits and vegetables is as varied and extensive, however, as similar lists for any of the other countries of Southeastern Asia.

Wet Fields

Throughout the countries bordering the South China Sea most of the cultivated land is used for the growing of lowland, or wet, rice. For this purpose the fields must be leveled and surrounded by earth dams to impound rain water during the rainy season or to confine the water that is carried to the fields through irrigation canals or lifted to the fields by mechanical means. If a field is properly leveled the surrounding dyke will keep the water everywhere at the same depth. The size of the wet-rice, or paddy, fields, and the amount of labor that is required to make them, depend upon the topography of the region. In the lowlands, where no terracing is required, there is relatively little labor involved in the making of paddies, which are frequently large. A hilly, or mountainous, terrain necessitates terracing, which demands greater effort and reduces the size of individual fields; the steeper the slope, the narrower the paddies. We have only to see the rice terraces of the mountains of northern Luzon, southern Bali, the Preanger districts of West Java, or Sumatra's West Coast in order to realize how much effort has been expended in building these terraces and how much energy must be devoted to their upkeep. The terraces, as well as the wet-rice fields of the plains, represent the accumulated efforts of generations of peasants, each of which has helped to extend the area devoted to the cultivation of wet rice (Figs. 50–58).[1]

Not all people show the same skill in the making of paddies. According to Credner, the Thai are quite helpless on sloping land that requires terracing before wet rice may be planted. They would prefer to migrate to a

[1] [see pp. 115 ff. cuto 90rv 116. -- Analyst]

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

243 184

region where level land is available rather than undertake the terracing of a hillside; on the other hand, they have been successful in building innumerable canals to tap rivers and spread the water over the plains.[9] However, they do not seem to be able to fight great floods. In contrast, the Annamese of Tongking have built huge dykes against destructive floods and the attack of the sea.

243

The problems presented by the cultivation of wet, or lowland, rice change from country to country, from region to region, and sometimes even from village to village. Lowland rice demands a soil thoroughly soaked with water and worked into "a fine soft mud by hoeing, plowing, trampling, or harrowing, and . . . free from weeds." [10] The field must remain under water until the ears of rice begin to fill and harvest time approaches. The amount of water required to grow lowland rice depends upon the variety of rice, the length of its growing period, and the nature of the soil. There are innumerable varieties of lowland rice. One way of grouping them is according to the number of days they take to mature, which ranges from 60 to 300 days. In the Philippines varieties that require less than 150 days are considered early maturing, those that need from 150 to 190 days medium-late maturing, and those needing more than 190 days late maturing.[11] The longer the growing period, the greater the water requirements and, generally, the higher the yields. Normally the water covering the field has a depth of from 10 to 15 centimeters. But "floating rice" can keep pace with a slowly rising flood and reach the amazing height of 4 meters or more. The stems settle on the mud when the water recedes, and new roots start at the upper nodes, while the lower parts of the stems rot away. Floating rice is especially well known in Cochinchina, and I have seen it in the Philippines. In 1939 the Department of Economic Affairs in Batavia sent a rice expert to Cochinchina to study floating rice and the possibility of introducing it into southern Borneo.

[654]

Lowland rice can be grown on many types of soil as long as a heavy clay subsoil is present to prevent the loss of water through percolation. Copeland states that lowland rice does best in heavy soils that hold water securely, and he adds that it is desirable "that there be, at a depth below the reach of the roots, but not too much further down, an impervious substratum-subsoil or hard-pan." [12] We distinguish between two main types of wet-rice fields: those that depend exclusively upon the rain that is impounded by their dykes, and those that are supplied by an irrigation system and are therefore no longer subject to the irregularities of rainfall.[13]

243 312

[9] Credner: Siam, 1935, pp. 203 and 217.

[10] Wickizer: "Rice and Wheat," 1941, p. 272.

[11] University of the Philippines: Handbook of Philippine Agriculture, 1939, pp. 7–11.

[12] Copeland: Rice, 1924, p. 45.

[13] An important variation of the second type is the cultivation of wet riceland that has been flooded by rivers rising above their natural levels. This mode of cultivation, which is found especially in the residency of Palembang in Sumatra, in southeastern Borneo, in Thailand, and in Indochina, is not so dependable as irrigation because of the irregularities of the river floods.

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

Irrigation systems also fall into two categories: peasant irrigation works and technical irrigation works. The former have existed throughout Southeastern Asia for more than a thousand years. In recent times scientifically trained engineers have designed large-scale systems with concrete weirs and locks. Fields solely dependent upon impounded rain water produce one rice crop a year, whereas irrigated fields often yield two crops. If even with irrigation only one crop can be produced, yet the irrigation system assures proper water control, whereas without it irregularities in the course of the rainy season may damage, or destroy, the crop.

Wet fields are protected against erosion by leveling, terracing, and dyking. But how does continued cropping affect the fertility of wet-rice fields? Diverse environments and cultural practices in Southeastern Asia create considerable differences in this respect. Much of the paddy land of the Philippines, Indochina, Thailand, Malaya, and Burma has lost a good deal of its original fertility because the peasants have not used manures, fertilizers, or crop rotation. In many instances, however, soil fertility has been preserved by the mineral matter dissolved in the irrigation water and by the silt deposited on those fields that are supplied with irrigation water coming from streams. The value of the water and silt depends, of course, upon the nature of the parent material from which it is derived. Rivers from a young volcanic region supply much richer water and silt than do those that drain a mountain region consisting of sedimentary rock or granite. For this reason, the Irrigation Service of the Netherlands Indies before making final plans for a new irrigation system takes samples of water and silt carried by rivers at different times of the year. The samples are analyzed in order to determine their influence upon the soil to be irrigated. A river found to be carrying water and silt that would lower the value of paddy land would be eliminated as a source of irrigation water, or its use would be limited as much as possible.

Irrigated fields of which the water supply does not contain minerals in quantities necessary for continuous satisfactory plant growth and paddy land that depends exclusively upon rain, both require other techniques for maintaining fertility. In many regions cultivators cut the rice stems just far enough below the ear to allow bundling. This practice makes possible the return of the rest of the plant matter to the soil. From this it is only one more step to work household refuse into the ground together with ashes of burned rubbish, rice husks, leaves, and manure.

As stable manure is not available in adequate quantities, intensive studies of the application of green manures to the cultivation of rice have been made in a number of countries of Southeastern Asia. A recent article by W. Bally reviews the results of these studies.[14] In a few rice-growing regions the peasants, on their own initiative, have learned to use legumes to improve rice soil. In wet fields the decomposition of green manure takes place under anaerobic conditions, and the final product is ammonia. Since

[14] Bally: "The Employment of Green Manures," 1936, pp. T10–T31.

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

with sugar or tobacco grown under plantation management. But is the high fertility of the soil due to this crop rotation, or is it rather the result of the heavy application of commerical fertilizer and the thorough cultivation of the soil under Western management?

In no country of Southeastern Asia is there so great a variety or so intensive a use of commercial fertilizers as in Japan.[17] In general, the peasants of Southeastern Asia lack money for commercial fertilizers. In Indochina local phosphates are within reach of some of the Annamese, but the costs of imported fertilizers are prohibitive. In Java, although attempts to make possible the use of fertilizers through the agency of public credit institutions were successful in some special instances, not more than one per cent of the cultivated area received any commercial fertilizer in 1939. On the other hand, estimates indicate that more than 1,000,000 hectares of sawah have a phosphate deficiency and that a moderate application of phosphate would augment the yield by 25 to 50 per cent.[18]

The Agricultural Advisory Service was able to raise the productivity of wet-rice fields in West Java by about 10 per cent. It encouraged the peasants to use fertilizer on seedbeds, to sow rice more thinly on the beds (thus producing stronger seedlings), and to plant the seedlings in rows so that weeding could be done with a special instrument, the *landak* (Fig. 59).[1] This weeder was developed in Japan. During the years immediately preceding 1939, these improvements in West Java resulted in an increase in output of unhusked rice amounting to 300,000 quintals, or 30,000 metric tons, with a value of nearly 1,000,000 guilders. This shows that some improvements in cultivation may increase production without a great capital outlay.[19]

Java may be compared only with southern China and with Japan in the cleanness of its rice fields. The Filipino does not pay much attention to weeding. The Malayan, Thai, Cambodian, Cochinchinese, and Filipino rice farmers have more flooded riceland per capita at their disposal than the people of Java and can thus afford to cultivate their land less intensively.

Irrigation Problems

Peasant irrigation works usually take care of the fields of only one village or of a small group of people who have joined together for the specific purpose of building and maintaining an irrigation system. These works consequently are small and usually inadequate, but nevertheless they de-

[17] "The chief commercial fertilizers used in Japan are pressed herrings, pressed sardines, dried sardines, other fish cakes, bone meal, soybean cake, rapeseed cake, cottonseed cake, other vegetable-oil cakes, ammonium sulphate, calcium cyanamide, calcium phosphate, and potassium phosphate. Calcium phosphate and ammonium sulphate are probably the most representative chemical fertilizers."—Wickizer and Bennett: The Rice Economy, 1941, p. 252, footnote 33.

[18] Departement van Economische Zaken: Voedselproblemen, 1940, p. 28.

[19] *Ibid.*, pp. 27–28.

[1] [See p. 117, category 116. -- Analyst]

1: Pe S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

land. An example is *mongo* (*Phaseolus mungo* L.), grown in Pangasinan and Batangas. Alarmed by the poor rice crops in 1940 and the difficulty of importing rice from Indochina and Thailand, the Philippine Bureau of Plant Industry, early in 1941, started to distribute seed of quick-growing dry-field crops, especially maize and legumes, in order to supplement the nation's rice bowl. But the average Filipino farmer is reluctant to accept this new practice, because "it is not the custom"—a powerful argument not to be easily overcome.

[249] [654] 241

Dry-Field Crops Cultivated by Plantations

The discussion thus far has been limited to the native cultivation of dry land and to annual crops. However, extensive areas of non-irrigated land are occupied by perennial crops that are grown on plantations owned by Westerners. The crops produced include tea, coffee, cacao, quinine, rubber, palm oil, coconuts, kapok, sisal, and other fibre plants. Some of these crops were cultivated for a long time without the proper measures being taken to protect the soil against accelerated erosion. Although the detrimental effects of plantation agriculture in Ceylon and southern India are notorious in the plantation history of southern Asia, results were just as disastrous in Malaya and in the Netherlands Indies. Westerners, accustomed to clean cultivation or clean weeding in the temperate zone, carried this practice over into the tropics, with the result that soil erosion was very severe on steep slopes and led to great losses in soil fertility. Today, however, these mistakes have been recognized; there is hardly a plantation that has not adopted measures to protect sloping land against erosion and level land against soil exhaustion. The planters of Java were the pioneers in this field, introducing or developing most of the protective measures. These measures include contour drains, silt pits, contour ridges, terraces, hedges, shade trees, and especially cover crops. The use of these measures varies according to the crop, or crops, produced and according to climate, soil, and slope; but the purpose of all of them is to encourage an effective ground cover and to check the rate of water run-off. The financial depression of the 1930's—resulting in the need for very strict economy and a decrease in production costs—has helped considerably to reduce the amount of clean weeding and to convince conservative planters of the value of preserving a ground cover, litter, and mulch. Such measures help not only to retard erosion but also to enrich the soil. The first Western planter who broke away from the custom of keeping the ground of his plantation free from weeds was L. M. Tyl, who in the years 1890–96 developed the "weed-system" and thus introduced the idea of a ground cover into plantation circles of Southeastern Asia. But it took many years before his idea was generally accepted. It is interesting to note here that the Asiatic-owned plantations and the small holdings producing perennial crops, such as rubber, usually did not practice clean weeding. This, in the early days, was regarded by European observers as a sign of laziness and

241 177 185 242

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

241 177 185 242

poor management, but, as has been so often the case, the Westerners were finally forced to admit the soundness of Oriental cultivation practices.

As we have seen, there are two principal means of protecting the soil between tree crops: by allowing the growth of indigenous plants or weeds (in other words the development of a natural mixed cover), or by establishing a pure cover of leguminous plants, many of which came originally from the New World. Rubber planters in Malaya seem to have had more success with the first method, which has been called "the forestry method of cultivation" or "rubber forestry." [67] Of course, the growth of indigenous plants or weeds must be controlled, and this is done by slashing the undergrowth from time to time. Frequently it is necessary to practice selective weeding in order to suppress undesirable plants and encourage more valuable ones.

654 249

Much research has been directed toward the study of leguminous cover crops which supply nitrogen, as well as foliage for green manure. This research was started in 1910 in the Botanical Garden at Buitenzorg. Some of the cover crops that have proved especially valuable and are widely used on modern plantations are *Calopogonium mucunoides* Desv., *Centrosema pubescens* Benth., *Centrosema plumierii* Benth., *Desmodium* species, *Tephrosia candida* DC. and *Tephrosia vogelii* Hook., *Mimosa invisa* Mart., *Cassia* species, and *Vigna oligosperma* Backer.[68] Several of these have already been mentioned in the foregoing discussion on the use of green manure crops in native agriculture.

Because a number of perennials such as tea, coffee, and cacao are commonly grown under shade trees, many writers seem to believe that these plants need shade. This may be true in part, but more important is the fact that the shade trees protect the soil against excessive losses of moisture and undesirable changes in soil composition, texture, and structure and thus prevent a reduction of the quantity of humus in the soil. Most of the commonly used shade trees are legumes which, in addition to shade, supply litter and nitrogen and help to increase the moisture-holding capacity of the soil, thus reducing the danger of erosion. *Erythrina micropteryx* Poepp., *Erythrina lithosperma* Miq., *Leucaena glauca* Benth., *Albizzia moluccana* Miq., *Albizzia chinensis* Merr., *Albizzia falcata* Backer, *Pithecellobium dulce* Benth., or Manila tamarind, and *Peltophorum pterocarpum* Backer are especially useful in this respect.

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[67] Haines: "The Uses and Control of Natural Undergrowth," 1934.

[68] For a very extensive list of cover crops, green manures, and shade trees, see Heyne: De nuttige planten van Nederlandsch-Indië, Vol. 3, 1927. See also International Institute of Agriculture: *op. cit.*

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

3. Economic Services and Production

654

Economic services, intended to improve the human factor in production, have somewhat the same character as public works intended to improve material resources. Like public works, they are primarily instruments of economic progress, world welfare, with native welfare as, potentially, a by-product. Like public works also, they often originate in the need for preventing the spoliation and exploitation characteristic of unregulated economic activities. Humanitarian sentiment condemned porterage, but it was the waste of human life and high cost of labour that stimulated railway construction. Similarly, in Burma as in the tropics generally, it was the devastation of the forests by free capitalist enterprise that created the need for a forestry service. Rich mineral deposits are often buried beneath the refuse of surface workings. In South Africa ostrich farming nearly committed suicide by killing off the ostriches.[1] One natural consequence of the improvement of communications in the process of economic development is the spread of diseases among crops and cattle. In all these and in other ways economic development creates a need for economic services. There is, however, one notable difference between economic service and public works. Whereas public works are mostly intended to promote general economic progress, economic services may be particularly directed towards promoting the economic progress of the natives.

Not infrequently it is assumed that all expenditure on economic services goes to native enterprise. Much of it, however, is incurred solely on behalf of western enterprise, and does not contribute towards increasing native production. Mineral deposits are worked almost exclusively by Europeans, and it is they who profit by the geological survey and mines service. Ordinarily, as in Africa, Europeans hold most of the commercial forests, to which the activities of the forestry service are mainly directed; it may, by reafforestation or in other ways, assist native cultivation, but protective forestry receives less attention, partly because it is less directly remunerative and partly because it lacks the support of native public opinion.[2] The economic services which touch native life most closely are those concerned with agriculture, veterinary care and irrigation, and even in these western enterprise commands a share, and sometimes the chief share, of

[1] *African Survey*, pp. 985, 993, 1313, 1492, 1499, 1528; Frankel, p. 65n.
[2] *African Survey*, p. 987.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

654 their attention. When, therefore, economic development is advocated on the ground that it provides funds for economic services, it is well to enquire how far these services are concerned with native rather than with western enterprise, and how far they do in fact make native enterprise more efficient. Information on such matters is not readily obtainable, but some light is thrown on them by a recent study of Malaya.

243 654 Formerly the natives of British Malaya cultivated little but rice. Conditions did not favour the growth of a large export market such as stimulated cultivators in other parts of Indo-China to extend their holdings, and the Government tried to encourage the cultivation of rice by regulations making it compulsory. In the early years of the present century, when the doctrine of efficiency was beginning to replace the principle of *laissez-faire* as the motto of colonial rule, an agricultural service was created. This included a paddy experimental station, but no one was appointed to specialize in rice, and experiments in the improvement of rice cultivation were discontinuous. About the same time plantation rubber was coming into favour, and the agricultural experts 'gave most of their time to the European and Chinese rubber planters'. Malays also found rubber profitable, and tended to substitute rubber for rice. Thus, with the influx of many hundred thousand coolies to the mines and plantations, the country became increasingly dependent on imported rice. When the war of 1914 and post-war developments stopped these imports, the Government had to import rice and lost £42 million on the transaction, while the estates and mines also lost heavily on importing rice for their coolies. 'The result of this experience was the decision that rice cultivation must be increased and more attention paid to native agriculture.'[1]

Accordingly the regulations for compulsory rice cultivation were enforced more stringently, and experiments were undertaken with a view to make it more profitable by improving the yield. Under the latter head progress was slow, as frequent changes in the agricultural staff hindered continuity of policy. By about 1925, however, the agricultural department claimed to have discovered new varieties that would enhance the yield by 30 %. This had little effect on extending cultivation, and in 1930 a committee was appointed to examine the situation. It estimated that the area under rice could be more than doubled by the addition of some 600,000 to 1,000,000 acres of potential rice land, but 'there was no one way of making paddy growing

[1] Mills, pp. 250ff.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

profitable and bringing about its extension. The problem must be attacked simultaneously through drainage and irrigation, agricultural betterment and the co-operative department.' One outcome of its recommendations was the reconstitution of the irrigation department in 1932, and the investigations of the new department confirmed the previous impression that 'all over the country padi lands were steadily going out of cultivation.... Even in the fine padi plain of Province Wellesley, ...conditions were steadily deteriorating, the cultivators in debt, and their *kampongs* (villages) often indicating a state verging on poverty.' During the next few years upwards of 40,000 acres were added to the existing irrigation schemes.[1] At the same time, under the influence of the depression there was a fall in the price of rubber, and by 1934 the area under rice had grown by over 100,000 acres.

In the following year, however, with a rise in the price of rubber, the area under rice fell by 35,000 acres. Thus although there was a wide area available for extending the cultivation of rice, and the fall in the price of rubber consequent on the depression encouraged cultivators to prefer rice cultivation, which at the same time was stimulated by compulsion, by extensive new irrigation and by the discovery of more productive strains, yet, with a population that increased between 1926 and 1936 by 29 %, the area under rice expanded by only 11 %.[3]

Area under rice[2]

(acres, 000)

1924–5	654
1929–30	657
1933–4	767
1937–8	726

This brief survey of the attempts to foster and improve rice cultivation in Malaya suggests that neither compulsion nor the efforts of the agricultural service to enhance production met with much success, and it contains many lessons of general application regarding the relation between economic services and the increase of production. The failure of agricultural experts to increase native production is often explained on the ground that it is difficult 'to persuade a conservative and easy-going peasantry to improve their methods',[4] and that the economic motive, the desire of gain, does not appeal to 'natives'. This is the easiest and most comfortable explanation of all failures to enhance native welfare; it is their fault and not ours. But it is inconsistent with the facts. While the Malayan was reluctant to grow more rice, he was taking readily to growing rubber. All over the Tropical Far East, native rubber has expanded rapidly, sometimes in the face of opposition. Similarly in Java the opposition of planters and

[1] Mills, pp. 262, 272, 274.
[2] Wickizer and Bennett, p. 314.
[3] *Ib.* p. 195.
[4] Mills, pp. 251, 259.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

of some officials could not stop the people from cultivating sugar instead of the less profitable rice.[1] In Africa as in Asia the people are only too ready to substitute commercial crops for food crops, and in parts of the Gold Coast and Tanganyika the farmers are coming to depend on the market for their food.[2] Everywhere the acreage of new crops under native cultivation rises and falls with the demand. The adoption of new crops is nothing new. In Netherlands India, of all the produce now cultivated by natives, only the coconut, soya and the spices are indigenous, and even rice is an immigrant. All the staple crops have come in from abroad over a period of many centuries, and that is true also of Burma. In Africa bananas, rice, wheat, and sugar were introduced by the Arabs in the seventh century, and the sweet potato, cassava and maize are attributed to the Portuguese. In the most notable modern developments of native production, agricultural services have played a very minor role. In Burma the two outstanding innovations in agricultural practice, the introduction of hard rice for the European market and, later, of groundnut, both preceded the creation of an agricultural department. So also did the substitution of transplanting for broadcasting in rice cultivation, which became general when the price of paddy rose sufficiently to justify the extra cost. In Africa 'the production of cacao in the Gold Coast and of groundnuts in Northern Nigeria are examples of the development of new industries almost without aid, when the African has been satisfied that production is possible and within his capacity...(and)...this wide adoption of maize and other crops, which are comparatively recent introductions is further evidence of capacity of adaptation'.[3] Where new crops or methods of cultivation are profitable, compulsion and expert assistance are unnecessary; where they are unprofitable, compulsion and expert assistance are of no avail.

General experience shows that even if tropical peoples fail to evince a desire of gain before contact with the West, this is one of the earliest lessons which they learn. For the introduction of new and more profitable crops it is not even necessary that the cultivators themselves should make the profit. Where economic development leads to land alienation and rack-renting, or wherever rents are fixed by competition, the land goes to tenants who can pay the highest rent, and cultivators are compelled therefore to adopt new and more productive crops, or cheaper methods of cultiva-

[1] *Netherlands India*, p. 321.
[2] *African Survey*, pp. 864–7, 961.
[3] *Ib.* pp. 883, 886.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

654 241

tion, even though the profit goes to the moneylender or the landlord. If an agricultural service can make the cultivation of any crop more profitable either to cultivators or landowners it will increase production; if it does not increase production, the presumption is that it has not enabled cultivators, working under local conditions and with the means at their disposal, to get a better return.

Even in Europe the application of modern science to agriculture is comparatively recent, and practical agriculturists are apt to view the suggestions of experts with suspicion not always unjustified. But the scientific study of tropical agriculture is still in its infancy, and experts must be cautious in their recommendations, for, if they base suggestions on experience in Europe, they are liable to make mistakes. For example, in Europe cultivators prize a warm soil and in the tropics a cool soil, and in other ways conditions are reversed, but specialists are not always capable of adapting to a tropical environment what they have been taught in Europe. In Burma deep ploughing was recommended to rice cultivators, until experience showed that this breaks up the hard pan which holds the water. The early rubber leases in Burma required planters to grow at least 400 trees to the acre, whereas the optimum number was about 80. Western planters condemned the neglect of natives to weed their rubber holdings until the recent depression, by precluding expenditure on the weeding of plantations, taught them that it reduced the yield of sap. Mistakes are accepted as inevitable by western planters, but shake the confidence of native cultivators in western science. There is no doubt that modern science can do much to improve agriculture in the tropics. It has already done much in Netherlands India, where the 'great cultures' have been built up on a scientific basis. But it is European agriculture that chiefly benefits from the modern science of the agricultural service. Naturally agricultural experts can do more for planters who believe in them, seek their help and employ methods of cultivation with which they are familiar, than for peasants who have no faith in modern science and believe, often not unjustly, that they know most about their own job; and just as naturally, where, as formerly in Malaya, there is a choice between helping the planter or the peasant, agricultural officials tend to do the work that is more obviously useful, and prefer to help the planter rather than the peasant.

But the immaturity of scientific agriculture in the tropics, the lack of continuity in policy and experiment, and the prior claims of planters

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

954
241

to assistance are matters of comparatively small importance. A far more serious obstacle to the success of agricultural experts is their ignorance of tropical economy. Everywhere production is a social function. In Europe we are apt to overlook this fact because our methods of production grow out of our established social life, and, because we do not notice it in Europe, we tend to disregard it in the tropics. The agricultural official is usually an expert in scientific agriculture, but one cannot expect him to have an expert knowledge of native social life. That is not his business; he is an agriculturist and not an economist. Consequently he tries to adapt native life to scientific principles instead of adapting scientific principles to native life, and, if the people do not accept his suggestions, he regards them as unreasonable. Under experimental conditions some new crop or new method of cultivation may seem profitable, but under the conditions of village life it must fit in with the established rotation of crops and with the available supplies of water and labour. In Malaya, for instance, if the new strain of paddy, said by the agricultural service to increase the yield by 30%, had given corresponding results in practical experience, it is difficult to believe that during the next five years the area under rice would have remained practically constant. In Burma at one time there was a suggestion that sugar palms should be cut down or taxed out of existence, the demand on fuel for sugar boiling was considered uneconomic; fortunately before much harm had been done, it was discovered that palm trees were a stand-by of the cultivator against famine, because drought does not affect the yield until the following year. Similarly, in Africa, 'agricultural experts are becoming more chary of introducing sudden changes in African agricultural technique, for, they say, Europeans lack knowledge of local conditions, and the indiscriminate application of European technique, such as the use of the plough, has in some places had disastrous results'.[1] 'An examination of the present methods used by natives to produce food or cash crops will reveal a planned effort, the balance of which may easily be upset by ill-considered innovations. . . . Such a system is of proved value in native eyes, and is peculiarly adapted to native conditions of life; it needs careful study before improvements can be recommended which are not only sound in themselves but will appeal to the cultivators.'[2] These things lie outside the province of agricultural science, and are not within the competence of experts.

[1] Wilson, p. 118.

[2] *African Survey*, p. 960.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

654 241

In other matters not only the agricultural expert but the individual cultivator is helpless, and even the whole village, working as a common unit, can do nothing. Production is a social function that extends beyond the village. In Malaya, as we have noticed, it has been recognized that the problem of making rice cultivation profitable requires the co-operation of numerous departments. (This raises the question of departmentalism, which we shall have to examine more generally.) Another illustration of the wide range of what may appear simple agricultural problems may be found in the marketing of crops. In Burma groundnut, and new varieties of beans and onions spread rapidly, without instigation from the agricultural service, because they found a market and were profitable. But attempts by the agricultural service to introduce chickpea, chillies and tomatoes where there was no market, met with failure, and the cultivators lost their time and labour. Tomatoes are widely grown and in one district cultivators were induced to grow a more productive variety. They obtained larger crops but could not sell them, because the flavour did not appeal to the Burman palate, and there was no local European market. Again, millers wanted a special variety of paddy. The agricultural experts produced a variety to meet their wants, and found cultivators to grow it. But it needed a special adaptation of the milling machinery, and this was impracticable unless the new variety was available in quantities requiring the co-operation of many cultivators over a wide area, so that those who grew it had to accept a lower rate and not, as they had been led to expect, a higher rate for their produce. Every such misadventure shakes confidence.

654

For these and other reasons the possibility of increasing native agricultural production through the assistance of an agricultural service are very limited. Similar obstacles beset the veterinary and other services. In general, economic services can increase production only where they appeal to the desire of gain by enabling the people *as individuals* to make more money; even this, as will appear below, does not always imply greater welfare. Many improvements, however, as we have seen, are profitable to individuals only through co-operative or collective action, and many, though possibly tending to increase the total volume of production, are prejudicial to the peoples as individuals. In such cases it is necessary either to appeal to some motive other than the desire of gain, or to employ compulsion. An appeal to social welfare requires conditions that are not easily fulfilled, and becomes more difficult with the increasing 'atomization'

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

654 of native social life; ordinarily therefore a remedy is sought in compulsion.

The resort to compulsion for improving output raises new difficulties. Where the expert aims at helping the cultivator to earn more, both have a common object, and the results are readily apparent and can be measured by the standard of profit, which both recognize. If the expert tells the cultivator that some new variety will give a larger yield or fetch a better price, the results soon test the value of his counsel. It is a different matter when experts recommend measures that may possibly improve production in general over a long period, but require time to test their value and, in the first instance, entail trouble or loss to individuals.[1] If they advocate the eradication of dangerous weeds, the use of chemicals for spraying, the destruction of diseased crops, the cutting down of oil palms to protect the market the inoculation of cattle at the risk of death, the castration of undesirable sires, or the slaughter of cattle to prevent infection, the benefits are distant and uncertain, and the disadvantages immediate and obvious. In such matters they cannot expect the co-operation of the people, but must rely on inspection by a costly staff of numerous subordinates on low pay, ignorant and probably corrupt. Under indirect rule they may enlist the help of native chieftains, but this, like all attempts to employ the chieftains as agents of western policy, tends to undermine traditional authority. Finally, the success of measures of this kind depends not on blind obedience but on genuine acceptance through a recognition of their value. If the regulations intended to promote efficiency are sound, one would expect Europeans to comply with them more readily than natives, yet it seems that in some matters there is least progress on European estates, 'where control is much more difficult to exercise'.[2]

654 241 Measures to make production more profitable may gain acceptance if in the long run they show a profit to individuals, even though entailing a temporary loss; it is true also that, so long as a communal sentiment survives, individuals may acquiesce in personal loss for the benefit of the community. In time, if possibly a long time, the value of such measures can be demonstrated, and assessed in terms of money. But it is a different matter to increase the production of unprofitable crops. In such cases the agricultural service and the cultivators have no common standard. If it is difficult and dangerous to interfere in native economy where output and profit, debt and land

[1] *African Survey*, pp. 912, 934, 937. [2] *Ib.* p. 970.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

654 241

alienation provide comparatively simple tests of the results, the objections are much stronger where experts run counter to the profit motive, and where their recommendations are based, not on agricultural or veterinary science, but on western views as to the nature and purpose of tropical economy. The attempt has often been made and often, perhaps invariably, failed. In Java in the reaction against the Culture system 'officials were so zealous in promoting the cultivation of rice rather than export crops as to insist on the cultivation of long-lived paddy, even where the soil or water supply was unsuitable'.[1] In Malaya, rice land was found to be going out of cultivation although regulations enforcing the cultivation of rice had been imposed for over thirty years. To-day history is repeating itself in Africa. 'The expansion in the growth of marketable crops has seemed to be leading to a dangerous reduction in subsistence crops', and 'there is to-day a much clearer recognition of the need for organizing subsistence production.' Accordingly provisions for the encouragement of subsistence crops have been framed in Northern Rhodesia, Tanganyika and Uganda.[2] Whether they will have greater success in Africa than in Java or Malaya time will show. They are unlikely to strengthen the authority of the native dignitaries enforcing them, or to foster affection towards the western Government responsible for preventing cultivators from turning their labours to the most profitable account; nor are they likely to make the agricultural service popular or to facilitate its work in other matters.

Moreover, in directing economic activities along these lines, it is hard to escape bias, and still harder to escape the suspicion of bias. When Europeans try to 'prevent the unwise extension of the growth of economic crops',[3] they are inevitably exposed to the unpleasant suggestion that they are chiefly considering western interests. We have seen that, in Malaya, it was the loss sustained by Government and the planters through the neglect of subsistence crops, that stimulated activity in promoting rice cultivation. In Africa interest in food crops grew with the need for healthy labour. Measures to encourage subsistence crops may easily be interpreted as meant to discourage unwelcome competition, and the more so because at various times the planting interest has, in fact, opposed the native cultivation of sugar, rubber and coffee. Even with the best intentions

[1] *Netherlands India*, p. 167.
[2] *African Survey*, p. 631; *Britain and Her Dependencies*, p. 23.
[3] *African Survey*, pp. 635, 887, 978.

7: Furnivall G-4, 5 (no date) 1948 ALl Southeast Asia ALl

654 241

it is obviously no easy matter to decide whether the extension of cultivation for the market is wise or unwise, and, in view of the generally inadequate acquaintance with native social and economic life and the deficiency and inaccuracy of tropical statistics, the material for a sound decision is unlikely to be available.

The foregoing remarks deal mainly with native agriculture, but this is the chief occupation in the tropics and has received most attention from colonial administrations. Similar considerations apply to other economic services intended to promote native enterprise. Undoubtedly native production grows, and often very rapidly, under western rule. But this is the natural result of greater security of life and property, and of the opening up of new markets, and in the past it has grown rapidly without the help of economic services, as the stimulus given by western rule to the desire of gain has been sufficient. The application of modern scientific methods to native enterprise should make it more efficient. That is the function of economic services. In practice, however, their contribution to the increase of production is confined within narrow limits. They can increase production only by making it more profitable to individuals and for various reasons, some of which we have noticed, this is rarely possible except in such matters as the introduction of new crops, which does not call for expert knowledge. Economic services can and do render much help to western enterprise, and they are useful instruments of progress; but they can do comparatively little to improve native enterprise. Thus the argument that development is necessary to provide funds for economic services in the interest of native enterprise is of doubtful validity and requires closer scrutiny than it usually receives.

4. Economic Services and Welfare

654 71

Unless economic services make native production more efficient, they obviously must be ineffective in enhancing welfare. But they may promote efficiency by increasing production or in other ways without contributing to native welfare, and may even have contrary results. In Malaya, so far as the agricultural service enabled cultivators to obtain a larger yield, it did not enable them to make a greater profit. One obstacle was a ring of Chinese mill owners.[1] 'The Malay had no option save to sell at the price offered by the middleman

[1] Mills, pp. 255. 261.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

who bought for delivery to the mills.' The Government accordingly built a rice mill in order to break the combine. (One cannot help noticing the contrast between the forceful action taken against a Chinese combine in Malaya and the tolerance of European combines in Burma.) But this touched only the fringe of the problem. From 40 to 90 % of the cultivators were not free to sell their crop in the open market because they were in debt either to Indian moneylenders or to Chinese shopkeepers. Similar conditions obtain generally throughout the tropics wherever the promotion of trade and native enterprise is a main object of policy.

We have seen how, in Africa, throughout the ages tropical peoples have been ready to accept new crops. But 'these early introductions were incorporated with the system of shifting cultivation and the staple diet became a form of rough porridge made from one or other of the grains or from cassava root, ground between stones or pounded into a mortar, and supplemented by a relish of vegetables, meat or milk'. Similarly 'the introduction of cassava and sweet potatoes by the Portuguese conferred an inestimable boon on many tribes by providing them with a famine crop which will flourish under conditions unfavourable to grain crops'.[1] The introduction of these new crops enriched native social life. But where native society has been brought into economic contact with the modern world, the introduction of new crops has a contrary result. In Burma the introduction of groundnut led to the substitution of groundnut oil for sesamum oil because, although less palatable, it is cheaper; cultivators sold their more valuable sesamum and used groundnut oil instead for cooking. Similarly in Java cassava tends to replace rice.[2] Native society has been unable to resist the economic process of natural selection by the survival of the cheapest, and the introduction of new crops has not enriched but has impoverished native life. One finds, of course, the same thing in the West, where potatoes have often displaced more nutritious edibles.

The purpose of economic services is to make production more efficient, and they tend accordingly to concentrate on export crops.[3] On the principle of the local division of function, the production of crops for export contributes to efficiency. Also it encourages trade and provides Government with revenue. But the profits from increased production go mostly to foreign middlemen and merchants; so far

[1] *African Survey*, p. 883.
[2] *Netherlands India*, p. 321.
[3] *Britain and Her Dependencies*, p. 23.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

as they remain with the natives, economic development may enrich a few but, unless kept under control, impoverishes the people in general and detracts from welfare by the disintegration of native social life. To seek a remedy by multiplying economic services is like casting out devils in the name of Satan, for they expedite the process, and, like public works, merely enhance the need for social services.

5. Social Services. Protection

Wherever economic forces have been released by the application of reason to the conduct of social life, it has been found necessary in the general interest to protect those who are adversely affected by the consequences. This is the key note of the long conflict between Capital and Labour. In the West Greece liberated reason from the restraint of custom; Rome substituted the stronger rule of law for the rule of custom; Christianity furnished a moral principle stronger than the rule of law for keeping rational activities within the bounds of social welfare. The happy fusion of these principles in the Renascence allowed a high degree of freedom without disorganizing society. It allowed the freer use of capital in the production of wealth, and there evolved the type of social organization often described as capitalist, or capitalism. But these terms are often loosely used, and it is important to be clear as to their meaning. Human labour applied to natural resources produces a surplus beyond what is needed for sustenance. This surplus, if stored, is wealth. Wealth applied to the production of more wealth is capital. Thus capital may be regarded as disembodied economic energy. Capitalism may be defined as the form of social organization in which economic forces are predominant or, at least, conspicuously prominent. Such a society may be defined as capitalist. But the term capitalist is used also to signify the owner or employer of capital, and is usually confined to those who own or employ capital on a large scale. Thus there may be a capitalist society in which economic forces are predominant without capitalists who are owners or employers of large capital; and there may be capitalists, owners or employers of capital, in a society which is not capitalist in its general character. The neglect of these distinctions often leads to confusion.

In Europe the principle of economic freedom grew out of social life, and a homogeneous society has been able by its inherent vitality, though not without much tribulation, to gain an ever-doubtful victory over the forces of disruption. In the tropics, however, economic free-

7: Furnivall G-4,5 (no date) 1948 ALL Southeast Asia ALL

Enquiry' by Wellenstein, a technique has been developed for turning to the best account such statistics as have any bearing on native welfare.[1]

Lord Hailey has remarked that in Africa the existing statistics might be considerably improved without additional expense, and that a comparatively small expenditure would make them much more useful. That remark applies also to Burma and probably to most other tropical dependencies. Unsatisfactory as the statistics for Netherlands India are in some respects, they do at least serve to illuminate many corners that are left dark elsewhere, and the general neglect to provide means for judging how far the benevolent aspirations expressed in statements of colonial policy bear fruit in practice, naturally affords a handle for critics of colonial administration to suggest that it is more keenly interested in economic progress than in native welfare. It is not enough that material should be available for measuring individual welfare. The analysis of welfare demands a suitable technique for measuring social welfare by presenting accurate and intelligible information regarding debt, civil litigation, crime, health, education and other matters that find no place in individual budgets of income and expenditure. There would still remain imponderable elements, those cultural and religious aspects of social life in the tropics which are the first to suffer from the economic struggle for survival of the cheapest consequent on the impact of the West. But this is no reason for neglecting to carry so far as possible the objective scientific measurement of welfare.

4. The Machinery of Welfare

The deficiency of statistical material is a notable defect in the machinery of welfare. But it is not the only, and not the chief, defect. It may seem that no special machinery is necessary, that the care for welfare may be left to the local official charged with the maintenance of order. That is very largely true. Any European official can tell the people that dirt breeds disease, or explain the benefit of vaccination, or advise them to destroy mosquitoes and rats, or bring to their knowledge new and more profitable crops, or suggest new breeds of cattle, or inculcate the advantages of thrift and the danger of getting entangled with money-lenders. None of the most urgent reforms in the daily life of tropical peoples calls for special scientific equipment beyond the stock of knowledge common to educated Europeans. Natives have frequently

[1] Furnivall, *Economic Journal of India*, 1934, p. 295.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

adopted of their own accord innovations which appeal to them, and it would seem possible for European officials to recommend European standards of hygiene and other reforms with little or no expenditure on welfare services. It is true that modern science has done much and can do more for the welfare of tropical peoples. The connection between rats and plague and between mosquitoes and malaria are recent scientific discoveries, and scientists have traced the origin of hookworm and beri-beri. There is unbounded scope for research, and useful expenditure on it is limited only by the funds available. But it is well to remember that research does not bear fruit until it is applied to daily life; its practical application depends on the efficiency of the machinery of welfare.

It is true also that administrative officials should be better able to promote welfare if they have the assistance of departmental specialists. But departmental specialists will usually need the help of administrative officials if they are to get into touch with the people in their daily life. The departmental specialist is probably an expert in his own line, but one can hardly expect him also to be expert in native economy and customs or to be proficient in native languages. It is useless for the medical officer to advocate shoes for hookworm if the people cannot afford to buy shoes, or for the sanitary department to devise modern latrines which the people will not use, or for the agriculturist to recommend crops which local conditions of labour or water supply do not allow the people to grow. Although the specialist may try to adapt native life to scientific principles, the administrative official should be capable of adapting scientific principles to native life. Thus the welfare specialist must ordinarily work in double harness with the administrative official by his side. But the administrative official can do little to promote welfare unless he knows the locality, and what needs doing; has influence that will lead the people to attend to his advice; and remains among them long enough to make certain that they act on it. All these conditions must be fulfilled if welfare work is to succeed.

The machinery ordinarily employed differs according as the system of rule is direct or indirect. In the adoption of direct rule one object was to promote greater welfare through liberating the people from arbitrary oppression by their own chieftains. On this plan all the administrative officials, European and native, became servants of the law, charged with administering equal law to all. When it became apparent that the law, while liberating the people from arbitrary will,

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

subjected them to mechanical economic forces, attempts were made to protect them against the action of these forces. That is the distinctive character of welfare machinery under direct rule; it allows free play within the law to economic forces, but attempts to mitigate their consequences. This is directly contrary to the method of indirect rule, systematized by Van den Bosch in Java, which tries to soften the impact of economic forces by leaving the people under their own chieftains and their own customs, while aiming to protect them against arbitrary oppression. Direct rule attempts to mitigate the action of economic forces; indirect rule aims at providing a buffer against their action. There is a corresponding difference in the machinery of welfare.

(*a*) *Direct Rule.* It is often suggested or implied that the promotion of welfare in the tropics requires nothing more than the provision of funds for the services of experts. But this view disregards the conditions limiting their activities. The application of science to the affairs of daily life is quite a novel idea even in Europe; each generation of doctors regards its predecessors as unscientific, and in agriculture, hygiene, dietetics and other studies, what is held for true to-day may be out of date to-morrow. But the tropics are still almost virgin lands in science; experience in Europe may be misleading and conclusions based on it invalid. Conditions are different or even contrary. Cultivation requires a cool soil instead of a warm soil; natives apparently maintain good health on a diet that, according to western science, is defective; plague and malaria were spread by measures intended to prevent them. The application of modern science to tropical problems requires long and patient research, and continuity of experiment. But tropical life is adverse to continuity; men go on leave or are transferred for administrative convenience. Lack of continuity nullified experiments on rice cultivation in Malaya, and official transfers hampered the researches of Ross on malaria. Moreover, any single problem may, and often does, require a whole staff of experts for its solution. In agriculture the investigation of a single crop disease may need the collaboration of agricultural experts, botanists, entomologists and so on. The same principle applies in almost all departments of economic and social life. If the agricultural expert, by patient research breeds a more productive variety of some generally grown crop, the people may be unable to take advantage of it because of difficulties in the supply of labour, water or credit; his work raises new problems for a wide circle of other departmental specialists and it will be wasted without their co-operation.

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7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

657
654
177
647

It is easy, given the funds, to multiply economic and social services. But the multiplication of service tends to defeat its own ends, and greater expenditure gives worse results through excessive departmentalism. Each specialist looks at life through departmental blinkers. The agriculturist sees nothing but the crops, the veterinary expert only the cattle; to the sanitary inspector the latrine is more important than the home, and the policeman would guarantee security more confidently if the whole population were in jail. Often the experts are at issue. The agriculturist advocates grazing reserves to provide fodder, while the veterinary officer wants to close them to prevent infection; the fishery officer advises the people to breed fish, and the medical officer drains the ponds to kill mosquitoes. Everywhere the specialist inclines to a narrow view of life, but in the tropics departmentalism has peculiar dangers; in Europe the expert looks at a familiar world, but in the tropics, owing to his ignorance of native life, the field is out of focus. In Europe the expert understands the public and the public understands the expert, because they have a common background, but in the tropics it is only the European community in the towns and western enterprise that has a mutual understanding with the expert and values his assistance. Thus the natives in towns prefer to live in the native quarter, where they can escape the unwelcome attentions of the sanitary inspector, 'whose unreasonable prejudice against picturesque filth is never understood';[1] and plantation coolies, on returning home, lapse into their old comfortable ways. Moreover in Europe there is an organic community, living its own life, which can decide for itself what it wants most; but in the tropics, where innovations are pressed on the people from outside, there naturally ensues a lack of co-ordination between the competing and often contrary activities of the departmental specialists; too many cooks, as usual, spoil the broth. The confusion may be mitigated on the Dutch plan by grouping allied services in large departments under a single head. But this device alone is insufficient. What an organic community does by the dynamic force of its inherent vitality must in the tropics be entrusted to some official personifying, as it were, the common social will. There must be someone to co-ordinate the activities of departmental specialists and to foster a demand among the people for their services.

64

Under direct rule the District officer, the local civil servant in charge

[1] Burns, p. 306.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

welfare, and it seems not unreasonable to assume that similar results will follow in the tropics. Schools, sanitary regulations, the improvement of agriculture, and so on, appeal to humanitarians as likely to improve individual welfare, and by making for economy in administration and business, they appeal to reason as well as to sentiment. Naturally colonial governments conceive of welfare on western lines, and administrative practice is concentrated on enhancing the welfare of the people as individuals.

These attempts to promote welfare are effective only so far as the people will respond to them. The West may scatter pearls, or what it takes for pearls, about the tropics, but the people will not pick them up unless they appreciate their value. Scientific agriculture, modern schools, western medicine and sanitary regulations may not conduce to, and frequently conflict with, what the people regard as welfare, but if they cannot get what they want they must take what they can get. Agricultural and other economic services may enable them to earn more as individuals; modern schools may provide their youngsters with 'a decent job'; they may adopt some western foods or remedies for illness, and they may, perhaps, go to hospitals to be cured of their complaints. But these are all individual benefits, and have no relation to welfare as a social good. Welfare consists essentially in harmony between the individual and the environment; the environment must allow him to obtain both what he knows he wants and also what he wants without being aware of it. Economic progress enlarges the possibility of welfare by increasing the command of man over material resources, but it profits the native as an individual only so far as he participates in the larger surplus, and it enhances his welfare only so far as it contributes, directly or indirectly, to the enrichment of his social life.

8. Welfare and Autonomy

There is, as we have noticed, a growing recognition of the complexity of welfare problems. 'The problems of development touch upon the work of officers in various departments, such as administrative officers, both at headquarters and in the districts, and the technical officers in the agricultural, veterinary, medical and other services. There is need for machinery to provide complete co-ordination between these separate departmental staffs.'[1] The health officer finds that he must seek assistance from the chemist and entomologist, and the veterinary officer

[1] 1940, Cmd. 6175, p. 7; *African Survey*, p. 1612.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

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looks to the forest officer to provide grazing for the stock. As experts come more and more to recognize the need for special knowledge outside their own branch of study, there is an increasing demand for the creation of new services, and welfare work is distributed among departmental officials who are unable to see life as a whole. At the same time there is a growing recognition that all aspects of life are closely interrelated. In Malaya the improvement of paddy is found to require co-ordinated action by the agricultural irrigation, co-operative credit, education and other services.[1] In Nyasaland the Welfare Committee comprises representatives of the Medical, Agricultural and Public Works Department together with non-officials. In Southern Rhodesia there is a Director of Native Development in charge of all native affairs.[2] The Dutch in Netherlands India minimize sectionalism by grouping the various services in large departments and, further, link up some of the departments by liaison officers. All these expedients may improve the co-ordination of the welfare machinery. But it still remains machinery, and acts mechanically on the people taken in the mass as an aggregate of individuals. Each group of specialists takes snapshots of the people from its own angle, but the composite photograph obtained by fitting the results together bears as little relation to the native world as a Hollywood film to life. It shows native life from an alien western standpoint and, however lifelike, it never comes to life. The more elaborate the machinery, the more mechanically it functions, driven by economic forces and not by human will. Improvements in the administrative machinery merely effect reforms which adapt the people better to the economic forces that dominate life in tropical dependencies. Evolution along this line leads to a dead end. It is the type of evolution characteristic of the lower forms of life which have survived by adapting their way of life to their environment; to adapt his environment to his way of life is the prerogative of man, and reforms adapting him to an uncongenial environment produce not harmony but discontent. The impact of the West has liberated forces which were formerly kept under control by custom; for the enhancement of welfare it is necessary that the people shall be enabled to regain control over these forces, that they shall regain their former autonomy. That a higher standard of welfare is a condition of autonomy is alleged as one ground for the elaboration of welfare machinery. But improvements in welfare machinery resemble improvements in applied science. Research in applied science may increase the efficiency of

[1] Mills, pp. 255, 262. [2] *African Survey*, pp. 1197, 1227, 1230.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

current practice, but the great scientific achievements come from research in pure science, which revolutionizes practice by attacking old problems along new lines. Similarly the elaboration of welfare machinery can have no appreciable effect on welfare, and still less can it promote autonomy. It will not give them what they want unless they want what it can give, and the promotion of welfare must be approached from a new angle by a revolution in method. The machinery is not only defective, but is applied on a wrong principle.

But, in the modern world, how is it possible for tropical peoples to get what they want? For the environment has changed, and not the people; they still, if left to themselves, would try to reproduce their old environment. But they have been brought into contact with the modern world and cannot get away from it. All the king's horses and all the king's men cannot set the clock back. They can get what they want only if they want what in the conditions of the modern world they *must* want. A fundamental problem of autonomy is to change the people so that they shall come to want, or at least voluntarily to accept, those conditions which the welfare of the modern world requires. Some light should be thrown upon this problem from an examination of attempts already made to introduce self-government among dependent peoples in various projects of colonial autonomy.

9. Autonomy

Colonial autonomy is closely linked with the Liberal tradition, which had two aspects. On the economic side it stood for economic freedom, freedom of person, property and trade; on the political side it stood for freedom of thought, speech and religion. Political freedom was regarded as the natural fruit of economic freedom. In the nineteenth century Liberalism was in the air. British and Dutch colonial statesmen alike claimed Liberal ideals though interpreting them differently; French Liberals recognized their colonial subjects as citizens of France, and Liberalism in Spain, suppressed at home, took refuge in the Spanish territories overseas.

During a great part of the century Liberals in Britain thought colonies a burden, and often cited Turgot's dictum comparing them to fruit that would fall from the parent tree when ripe. Men looked forward to the day when India should be able to stand alone as the proudest day in the story of British rule. Practical administrators like Sir Thomas Munro argued that when Indians were sufficiently enlightened to frame a regular government for themselves, it would

7: Janlekha X-4,5 (1948-1953)1956 AO7 Central Thai
Southeast Asia AL1

development who fear that these countries might not be able to expand their production faster than population expands, in which case the result of economic development efforts will be a greater quantity of people with little or no gains in the quality of living conditions. In Zinkin's words, "The growth of population and the impact of the West have between them, in the last hundred years, so upset the delicate balance that most of the Asian countryside is now bankrupt . . . . The alarming feature of the peasant economy of Asia is not simply that it is desparately poor. It is that in recent decades, and in most countries of Asia, it has been growing poorer. It is a changing, dynamic economy. But it has been changing for the worse."[23]

Poverty is not new in Southeast Asia. What is new is the awareness of poverty and the conviction that something can be done about it. "A great change", reported Harold Butler, "is stirring Eastern society. The consciousness of misery has been created by the growing realization that it is not the inescapable lot of the poor and that chances of better life now exist."[24] All of the countries in Southeast Asia have within the past decade set up official agencies charged with planning and promoting economic development; and for international assistance to hasten it, is the constant

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23. Zinkin, op. cit., p. 34.

24. Harold Butler, Problems of Industry in the East (Geneva: International Labor Office, 1938, Studies and Reports, Series B, No. 29), pp. 65-66.

7: Janlekha X-4,5 (1948-1953) 1956 AO7 Central Thai
Southeast Asia AL1

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648 theme of their spokesmen in the economic and social organs
185 of the United Nations. It is probably too early at this moment to speculate on the outcome of Southeast Asia's
000 determination to industrialize. Much can be said, however, about the element of urgency and speediness commonly attached to each project of industrial development envisaged by each of these countries. "For successful development," cautions Staley, "two things are necessary: a substantial and continued economic advance -- and a social and political outcome which produces self-reliant citizenship in a free society, stable and responsive democratic government, and cooperation with other free societies."[25] The same writer warns that if capital investment and material technology are puched energetically in an underdeveloped country while little or no attention is given to deliberate promotion of appropriate social and psychological change, the result is likely to be either a failure of the development process to "take" and become "self-generating" or creation of a menace to the free world.[26] Garner also gives similar warning, "People have to develop themselves before they can change their physical environment, and this is a slow process."[27]

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44 A most important factor that has kept Southeast Asia economically underdeveloped is the small size of market in

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25. Staley, op. cit., p. 202.

26. Ibid., p. 203.

27. Ibid., p. 203.

10: Thompson S-4 (no date)1947 ALl Southeast Asia ALl

the indigenous peoples were not sufficiently willing, numerous, or skilled to replace the immigrant laborers. A higher wage scale, they feared, might compel many firms either to go out of business or to install expensive machinery. Already local nationalists, succumbing to the philosophy of economic self-sufficiency, were demanding intensive programs of government-aided industrialization. If such demands were acceded to, the industrialists and labor leaders in the home country could be expected to protest strongly against the new competition.

In this complex situation, the colonial governments of Southeast Asia gradually yielded to the popular demands, although loath to abandon their traditional function as instruments of capitalist planning in the home countries. With the exception, however, of the embryonic and ineffective industrial programs of the Siamese and Burmese governments and the more constructive policy of the Netherlands Indies for a planned industrialization, none of the countries did much in this direction. None was forced as yet to consider very seriously that change in colonial relationship which would result from general economic development in the world and specifically from the new role that China and India would inevitably play before long in Southeast Asia. The Japanese invasion interrupted the efforts of local governments toward a solution of these labor problems. It also injected new elements into the situation.

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LABOR ORGANIZATION IN SOUTHEAST ASIA

FOR VARIOUS REASONS an organized labor movement has never developed in Southeast Asia to notable dimensions. In large part this was because of the predominance of alien, transient, and illiterate labor forces, divided—even when of the same nationality—by geographical and linguistic differences. The Indians were further subdivided by caste and religious sect. The Chinese had a far better family, guild, and secret-society organization; but the antagonisms imported as an integral part of these organizations provoked periodic violence. Later the political and gangster elements which operated within their framework impelled all the governments throughout Southeast Asia to control them severely.

National solidarity among the immigrant labor groups was further broken up by the methods of recruitment and management. Agents and foremen exploited their compatriots for their own personal gain, until the governments concerned were gradually and reluctantly forced to intervene. Asiatic agents behaved much as recruiting agents of emi-

10: Thompson S-4 (no date)1947 ALl Southeast Asia ALl

Chinese Indians

466 167 grants to the United States did in Europe until they were checked. They consistently misrepresented to prospective recruits the conditions of work that awaited them, herded them aboard ships and in lodgings under conditions of filth and crowding, and tried to crimp their competitors' labor forces. Immigrant Asiatic foremen also were similar to their prototypes among immigrant foremen in the United States. They were notorious for the "cuts" they took from their crews' wages, for their unscrupulous profiteering from the sale of food and other necessities to the workers, and for their brutality toward those recalcitrant under arbitrary rule. Nor were alien Asiatic employers liberal in their relations with compatriots among their labor forces. Small Chinese-owned estates and mines were regularly cited in the reports of independent labor inspectors as the most delinquent in their observance of health and safety regulations. Singapore Indian shop-owners were the object of unpleasant publicity regarding the long working days, irregular and inadequate wages, and general tyranny meted out to their compatriot assistants. Disinterested labor leadership or even employer paternalism was conspicuously absent among the immigrant groups.

466 Working conditions were not much better in the enterprises owned by indigenous employers; but they were less conspicuous than those of the immigrant employer's shop, as most of the native workers are farmers scattered over the land and cared for, when in need, by the traditional village and family organization. Little was done by the native governments, whenever they were in power, to better the lot of the small native farmer-artisan. The Siamese and Burmese governments falteringly attempted to introduce scientific agriculture, to improve cottage industries and to reduce the landless proletariat; but their efforts were directed more toward ousting foreigners who preyed on the people, particularly alien landowners and moneylenders, than toward improving labor conditions of those working for indigenous employers. The Siamese National Assembly, in 1938, turned down a proposal for labor legislation designed to set maximum hours and minimum wages and to restrict child labor. Its policy on labor organization was much the same as that of the colonial governments, that is, to keep the labor forces under control and to exhibit, at most, a certain indulgence toward the formation of unions in some trades or localities where this seemed advantageous.

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Wherever labor legislation was introduced in Southeast Asia, the initiative came from the government and not from the workers. Originally it was the difficulties which European employers experienced in retaining their workers (at first domestic servants and later plantation laborers) that inspired legislation which imposed a penalty upon employees for their non-observance of agreements. Gradually, throughout the region, this penal sanction was abolished and more beneficial types of legislation were introduced to reduce the labor turnover. Considerations of

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